

PTO 09-2376

CC=JP  
DATE=19870114  
KIND=A  
PN=62007019

DISPLAY DEVICE  
[HYOJI SOCHI]

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UNITED STATES PATENT AND TRADEMARK OFFICE  
WASHINGTON, D.C. JANUARY 2009  
TRANSLATED BY: SCHREIBER TRANSLATION, INC.

PUBLICATION COUNTRY	(10):	JP
DOCUMENT NUMBER	(11):	62007019
DOCUMENT KIND	(12):	A
PUBLICATION DATE	(43):	19870114
APPLICATION NUMBER	(21):	60-145780
APPLICATION DATE	(22):	19850704
INTERNATIONAL CLASSIFICATION	(51):	G 02 B 27/08 ; G 09 F 9/30
PRIORITY COUNTRY	(33):	
PRIORITY NUMBER	(31):	
PRIORITY DATE	(32):	
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DESIGNATED CONTRACTING STATES	(81):	
TITLE	(54):	DISPLAY DEVICE
FOREIGN TITLE	[54A]:	HYOJI SOCHI

1. Title of Invention

Display Device

2. Claim

- (1) A display device made up of a cylindrical mirror body wherein a plurality of reflecting mirror surfaces are used as reflecting surfaces facing inside; an object facing one opening part of this mirror surface body; an enlarging lens facing the other opening part of the abovementioned object; and a screen placed in the optical axis direction of this enlarging lens;
- (2) A display device described in Claim 1 wherein the mirror surface body combines three reflecting mirror surfaces;
- (3) A display device as described in Claim 1 wherein the screen is opaque or translucent;
- (4) A display device as described in Claim 1 wherein the object is a translucent sheet which has been provided with a color;
- (5) A display device as described in Claim 1 wherein the object is a film provided with a color;

- (6) A display device as described in Claim 1 wherein the object is a luminant;
- (7) A display device as described in Claim 1 wherein the screen is a half mirror.
- (8) A display device provided with a cylindrical mirror surface body on which are formed a plurality of reflective mirror surfaces so that the reflective surfaces face inward; an object facing one of the openings of this mirror surface body; an expansion lens facing the other opening part of the abovementioned mirror surface body; and a screen placed in the optical axis direction of this expansion lens, the invention characterized as a display device wherein the abovementioned object is accommodated in a movable body which moves in a direction so that it crosses the extension line of the center line of the abovementioned mirror surface body so that the position can be moved and changed according to the movement of said movable body;
- (9) A display device as described in Claim 8 wherein the movable body is a plate-shaped rotor which turns

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around the axis of rotation;

- (10) A display device as described in Claim 8 wherein the movable body is a plate-shaped oscillating body which oscillates around the axis of oscillation;
- (11) A display device as described in Claim 9 wherein the plate-shaped rotor which is shaped like a hollow disk and which accommodates the object inside so that it can move freely inside said hollow interior;
- (12) A display device as described in Claim 10 wherein the plate-shaped oscillation body is fan-shaped and is hollow and accommodates the object so that it can move freely inside said hollow interior;
- (13) A display device made up of a cylindrical mirror surface body which orients the reflecting surfaces of a plurality of reflecting mirror surface inward; an object facing one opening part of the mirror surface body; an expansion lens facing the other opening part of this mirror surface body; a light source used to irradiate the object; and a screen placed in the optical axis direction of this expansion, the invention characterized as having the abovementioned mirror surface body maintained so that it can rotate freely and which can rotate in the circumferential direction by using a suitable drive means;

(14) A display device as described in Claim 13 wherein the mirror surface body is accommodated inside the cylindrical body so that said cylindrical body is retained so that it can rotate freely on the rotating roller.

### 3. Detailed Description of Invention

#### (Industrial Field)

The present invention relates to a display device which can be used for display devices and the like used for display wherein it is incorporated inside a sign and used so that it can move, it is used as a display product or makes a display when a prize is won by incorporating a game such as a pachinko-like "Yugi" game station.

#### (Prior Art)

The display device in the present invention is a display device wherein a plurality of reflective mirror surfaces are combined thereby forming a cylindrical mirror surface body having a polygon sectional shape, an object facing one opening part using the reflective surface of this mirror surface body and an expansion lens facing the other opening part is passed through and projected on the screen. The present invention relates particularly to a

display device which faces the opening part of the mirror surface body and provides an irregular movement so that it can move freely, project this object on the reflective mirror surface of the mirror surface body using light from a light source projected in a pattern which moves on the screen passing through the abovementioned expansion lens or the abovementioned mirror surface body is turned and likewise projects the moving pattern.

There is a well-known kaleidoscope used as a toy wherein a plurality of mirror surfaces are incorporated so that they form a cylinder, the object is projected inside and the user has the pleasure of seeing the patterns which move and change when the cylinder rotates when seen from a peep hole placed on one opening part of the cylinder.

The present invention provides a display device wherein an object is used as a large number of reflecting images passing through the mirror surface body and removed to the outside by applying the principle of this kaleidoscope, the object is projected on a screen and the user is entertained without having to look at it from a peep hole.

(Problems Which the Present Invention is Intended to Solve)

Therefore the well-known conventional kaleidoscope indicated above moves the object projected inside by turning the mirror surface body manually, a complicated combination and change of a plurality of objects is brought about, there are reflected on the mirror surface, a large number of virtual images are created and can be viewed as a pattern. This pattern is seen from the peep hole specially placed on one opening part of the mirror surface body.

The present invention provides a display device wherein an image projected into the mirror surface body is removed to the outside passing through a lens by applying the principle of this kaleidoscope, this is projected on the screen and can be viewed over a wide area. Meanwhile, the object is accommodated inside the movable body which faces one opening part of the mirror surface body, said movable body is operated by using a motor or other drive means or an image projected by turning the mirror surface body. This means that the patterns can be changed automatically and continuously.

[Means Used to Solve the Problems]

The display device in the present invention is made up of a mirror surface body which combines a plurality of reflective mirror surface thereby forming a cylindrical shape; an object; a light source which reflects the object on the mirror surface body; an expansion lens which faces

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the other opening part of the mirror surface body and expands the virtual image and the actual image reflected on each of the reflective mirror surface to the outside; and a screen which forms an image; either the object or the mirror surface body or both of these are moved and the image projected on the screen is moved and creates a moving pattern so that a continuous change can be provided to the pattern on the screen by the continuous movement of the object or the mirror surface body; at the same time, this pattern is greatly expanded by using the expansion lens, is projected on the screen and can be easily seen visually.

The three reflective mirror surfaces can be combined as the mirror surface body in the present invention and they can be shaped like a right triangle when seen in cross-section. However, the number of mirror surfaces can be increased and it can be made into a polyhedron.

Moreover, a disk rotated by the motor is prepared and will be described in detail later on in practical embodiments of the present invention. The object is accommodated in the aperture part provided on this disk and aside from ensuring that the object can be moved freely inside the air gap part, it is provided with a fan-shaped oscillating part and the object is accommodated inside, it is oscillated on the opening part of the mirror surface body by a motor or other drive means, the object is moved and changes are provided to the pattern which is projected on the screen.

Furthermore, besides using the colored translucent sheet-like small piece in the object in the present invention, a small piece with a picture, pattern and writing is suitable as well. In this case, when a plurality of types of small pieces with different colors, shapes, sizes and the like are combined, a pattern having further changes can be obtained. Moreover, besides this, a flash lamp, light-emitting diode and the like are incorporated in the object itself and used as a luminant and a pattern made by using light may be projected onto the screen.

The display device in the present invention makes it possible to enjoy changes in the pattern projected onto the screen as is. However, the pattern is projected onto the

back using, for example, a translucent plate on the screen which is seen from both front and back surfaces, characters for advertising and the like are expressed and become a means used for advertising. Or the shadow of the object is projected passing through the mirror surface body on this and is useful in turning the inside and outside walls into a display medium.

Next, we shall describe a practical embodiment illustrating the display device in the present invention and we shall clarify its characteristics.

[Practical Embodiment of Invention]

The practical embodiment indicated in the figures is an example of the display device in the present invention and Figure 1 is an explanatory diagram made into a partial cross-section used to explain the structure of the device. Figure 2 is a vertical sectional view seen along line II-II in Figure 1. Figure 3 is a frontal view of part of the pattern appearing on the screen.

Figure 1 is a mirror surface body; Figure 2 is a movable body; Figure 3 is a light source; 4 is an expansion lens; and 5 is a screen.

Here, mirror surface body 1 consists of a combination of three reflective mirror surfaces 1a and forms a cylindrical body which is triangular when seen in cross-section. Movable body 2 is made to face one of the opening parts of this mirror surface body.

Movable body 2 accommodates object 6 which is projected on the mirror surface, this is moved, the reflective position is moved relative to the mirror surface and the patterns projected on screen 5 (to be discussed further on) are changed. In this practical embodiment, glass plate and other disc-shaped opaque plates 2a, 2a are set so that they face each other and air gap part 7 is shaped so that it forms a disk having an air gap 7 between these. A rotation axis 8 is placed in the center of this and turned by driving a motor (not shown in figure) and provides movement to the object 6 accommodated on the abovementioned air gap part 7.

The abovementioned air gap part 7 is formed as a thin donut-shaped space along the circular part of the disk and many irregular and colored small piece-shaped objects 6 are projected on this, these small pieces are made so that they can move freely when turned by the motor. This movable body approaches the opening part of the abovementioned mirror

surface body 1 while rising up vertically and the lower part is made so that it faces directly (see Figure 2).

Light source 3 is placed so that it is positioned on the line extended to the center line of the abovementioned mirror surface body 1, the abovementioned movable body 2 is clamped and is made to face one of the opening parts of the mirror surface body.

Here, light collected by converging lens 9 between these movable bodies is dispersed uniformly and light-diffusing body 10 which irradiates the movable body facing the mirror surface body is inserted.

Expansion lens 4 is placed at the other opening part of mirror surface body 10 and screen 5 is placed on the line which extends passing through this lens.

Although screen 5 may be opaque, it is translucent in

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this practical embodiment of the present invention.

The device in the present invention is configured as indicated above. Movable body 2 is turned by the motor, object 6 accommodated inside air gap part 7 is stirred and moved. When light is applied from light source 3 to this, the light is received and the object is projected directly on the screen 5 passing through the expansion lens. At the same time, it is reflected on each of the reflecting mirror

surfaces of the mirror surface cylinder and likewise projects a virtual image on screen 5 passing through expansion lens 4.

Figure 3 is an explanatory diagram indicating part of the image expressed on screen 5 when a single round object is accommodated in air gap part 7 of movable body 2 and is projected and a single real image (indicated by the black circles in the figure) and a large number of virtual images are expressed conventionally. When movable body 2 is turned in this state and small piece 6 moves, each of the virtual images and real images differentiate the reflective position in keeping with this and move and are projected as different figures, they become the pattern and are imaged. Then, when the normal movement is provided when the movable body is provided to this small piece, it is expressed as a moving pattern on the screen. Moreover, when a large number of small pieces are colored so that they are different colors and then projected, they are expressed as a moving color pattern which is extremely rich in changes.

Furthermore, in the abovementioned practical embodiment, we provided an explanation based on the positional relationships between each of the constituent parts. However, when the device in the present invention is accommodated in a single box-shaped case, a window is

provided to the wall part of the case and the translucent glass plate is fitted in as a screen 5 to this, the movement of the object small piece accommodated in the movable body is projected on this glass plate and can be seen as a pattern which moves from the back side, that is, from the outside.

Moreover, in this case, when reflective mirror 11 is placed on the line which is an extension of the expansion lens, the position of the screen can be changed freely and the shape of the case itself can be selected freely.

In addition, when an opaque screen is used instead of the abovementioned transparent translucent screen, this screen is [illegible] from expansion lens 4 and can be seen enjoyed from the projection side.

Moreover, rotation axis 8 was shaped like a disk which turns around the center as a movable body 2 in the practical embodiment illustrated. However, it need not be disk-shaped as long as object 6 is made to face one of the opening parts of mirror surface body 1 so that it is synchronized with its movement. For example, the same effect may be improved by setting in place an oscillation center axis instead of the abovementioned rotation axis 8, fixing a fan-shaped oscillation body so that it oscillates

to the left and right or up and down so that the of the mirror surface body is crossed.

Meanwhile, the practical embodiment in the abovementioned explanation described an example in which the object was moved solely to find the changes in the pattern. However, in addition to moving this object or fixing the object, the pattern which moves on the screen can be projected by turning the mirror surface body reflected.

Figure 4 is a practical embodiment in this case. When cylindrical shell body 1b on mirror surface body 1 is supported by rotation roller 12 and is rotated so that it can rotate freely, belt 13 is extended on this shell body 1b and is turned by motor 14, the image of object 6 projected on the screen is moved when reflective mirror surface 1a moves and the pattern is changed. Needless to say, here we are looking for changes in the pattern by the rotation only of mirror surface body 1. However, needless to say, when the rotor is turned in combination with this and like the abovementioned explanation, the object is moved, the pattern is rich in changes.

Incidentally, there is a method whereby light from light source 3 set separately relative to the object in the abovementioned practical embodiments is applied and reflected. However, the user can enjoy changing patterns even if the light source is incorporated in the object itself. For example, a flash lamp or light-emitting diode can be incorporated and light emitted so that the pattern of the light is projected on the screen.

{Effect of Invention}

The device in the present invention is configured as indicated above. Light from the light source is received, reflected on each of the reflecting mirror surfaces of the mirror surface body and the object projected creates many virtual images by repeating the reflection inside the mirror surface body. Meanwhile, the abovementioned object is projected on the screen passing through the expansion lens. The abovementioned object is such that movement is provided by the movable body and the position is varied or movement on the screen is provided when mirror surface body turns and it is projected as a pattern which changes.

Thus, the present invention irradiates an advertising tower which can express screen patterns which are extremely rich in change or it can be used as a display means focused

on changes in patterns. It can be used as a decorating tool by downsizing it and incorporating it in the Yugi part of a pachinko machine and can be used within the wide parameters of a display means for winning prizes and the like.

Needless to say, when working the present invention, besides enhancing the changes in combinations made by varying the shape of the object, changes can be enhanced on the colors through various colorings so that these can be selected freely.

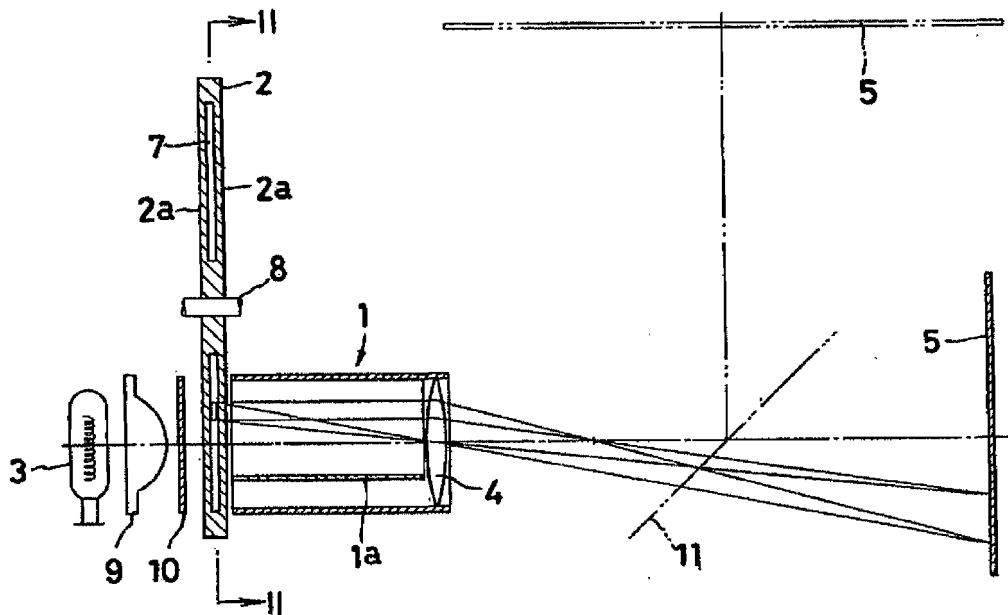
Moreover, when a half mirror is used on the projection screen, not only is it possible to enjoy the patterns from both surfaces, but when the light source flashes on and off by incorporating this screen onto the abovementioned display means, it becomes a simple mirror with a pattern so that it is highly useful when attracting attention and can be worked effectively as an advertising means.

#### 4. Brief Explanation of Figures

The figures indicate a practical embodiment of the present invention. Figure 1 is an explanatory diagram of a partial sectional view which explains a schema of the configuration. Figure 2 is a sectional view along line II-II in Figure 1. Figure 3 is a frontal view of a part of the pattern which is expressed on the screen. Figure 4 is an

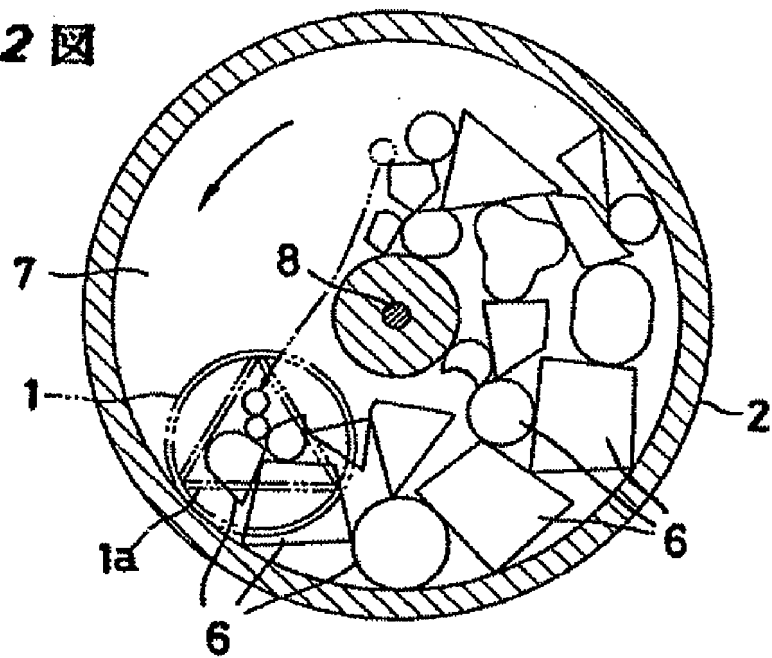
explanatory view of the rotation of the mirror surface  
body.

- 1..mirror surface cylindrical body; 2..movable body;  
3..light source; 4..expansion lens; 5..screen; 6..object;  
7..air gap part

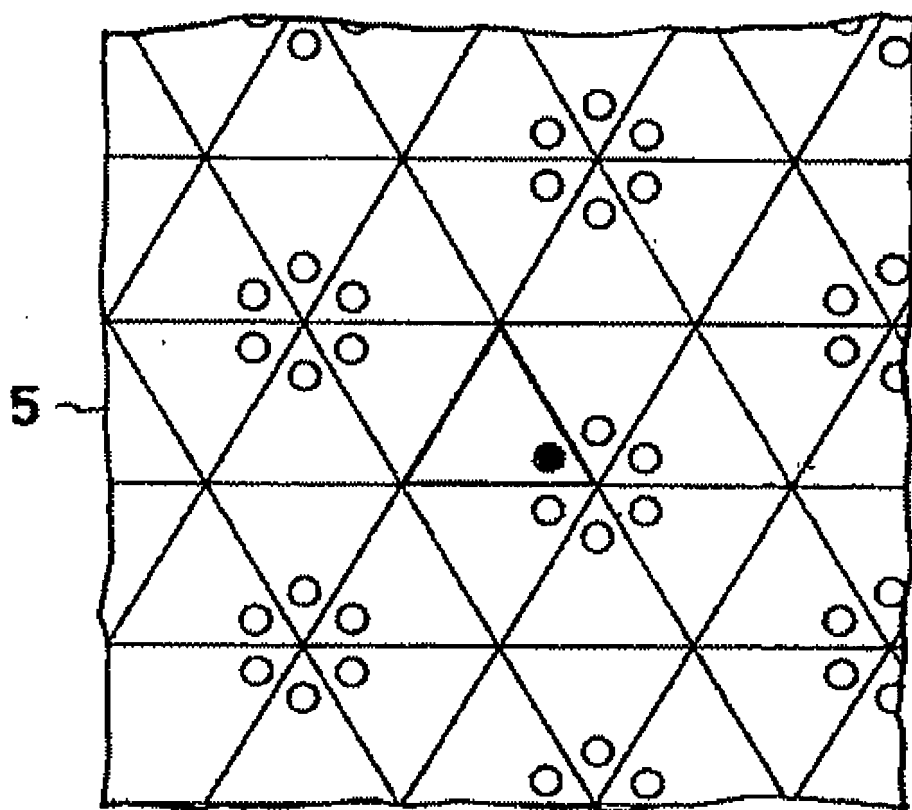


[Figure 1]

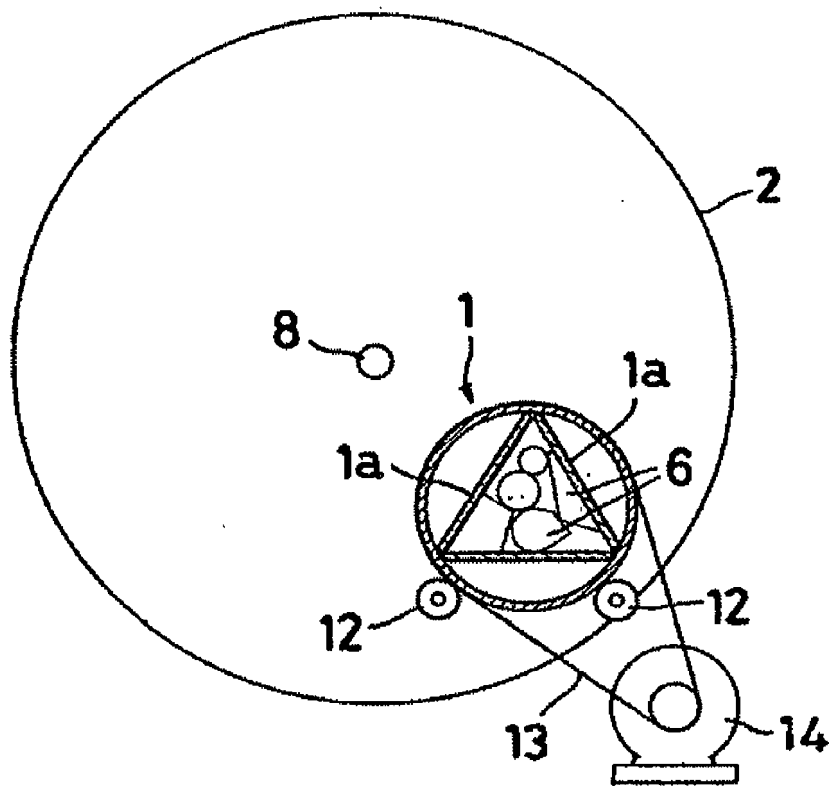
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[Figure 2]



[Figure 3]



[Figure 4]